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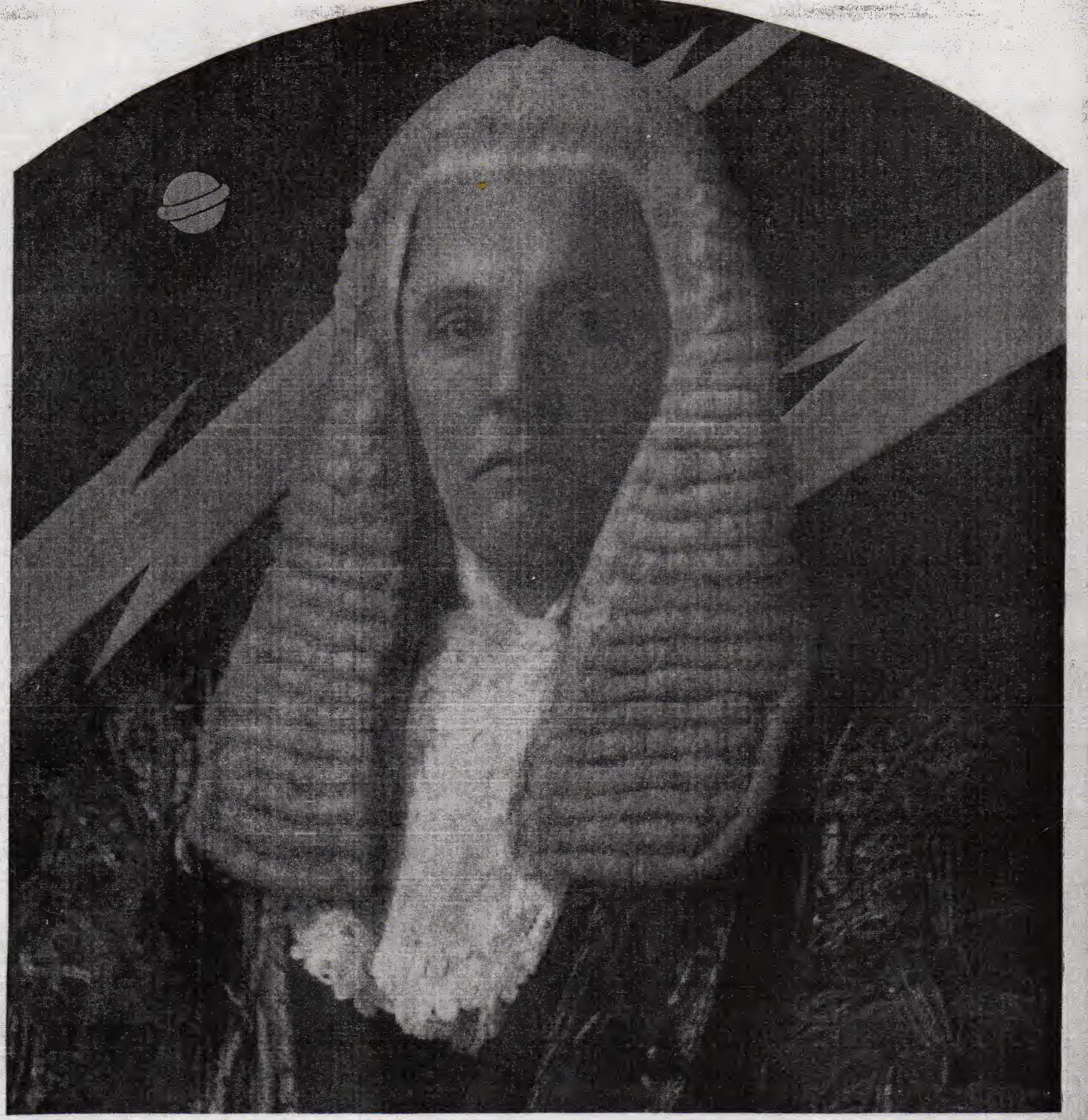

P. S. Rogers

THIS is a startling, prophetic look into the future. Its author is not a dreamer or a harebrained fanatic. Lord Birkenhead is one of the foremost statesmen in England today.

Save this issue of Cosmopolitan. You won't be alive in 2029, but your children's children will be, and it will be interesting for them to check the accuracy of the predictions here made by Lord Birkenhead.

¶ Babies will be produced by chemists in laboratories.

¶ The entire institution of marriage will be changed.

¶ We will all live to be 150.

¶ No one will need to work more than two hours a day.

¶ Agriculture will be abolished—except as a hobby—and all foodstuffs will be produced synthetically.

¶ Man will be able to alter the geography or climate of the world.

¶ Coal-mining will be an extinct industry.

¶ A forty-eight-hour day will come into being by retarding the rotations of the earth.

¶ Sitting in our homes we will see and hear events the world over.

Save this for Your Children's *Children*

It is a Forecast *of* What This World Will Be 100 Years From NOW

By the Earl of Birkenhead

A CENTURY hence it appears probable that the application of scientific discoveries will have altered the conditions of human life at least as much as they have done in the past hundred years.

A child born in 1829 arrived in a world which was just beginning to exploit the steam-engine, in which electricity was the useless toy of a few professors, where anesthetics and antiseptics were unknown.

The child of 2029, looking back on 1929, will consider it as primitive and quaint as 1829 seems to the children of the present day. Our means of travel, our sources of wealth, our medicine and even our ideas will change as drastically during the next century as they did in the course of the last.

Applied physics, which has given us the steam-engine, the internal-combustion motor, as well as wireless, telephones and all the many other practical uses of electrical energy, will certainly make prodigious advances before the year 2029. At the moment, however, the theoretical basis of physics rests in an undetermined state. Physics is on the brink of a new synthesis, a fresh simplification and restatement of fundamental ideas. This, when it comes—and it cannot long be delayed—must radically change all our assumptions concerning time, space and the nature of change.

Such a revolution of ideas must be accounted among the most important effects of science upon human life in the next century; but it is, of course, very difficult to predict what direction this change of ideas will take. Until another Newton restates physical theory, one cannot determine how his restatement will react upon the every-day world.

It is easier to prophesy concerning the material changes which will be wrought by applied physics in the next hundred years.

The best scientific opinion believes that before 2029 physicists will have solved the problem of supplying the world with limitless amounts of cheap power.

At present we derive the energy which drives the wheels of industry from coal and oil. Both these substances are won from nature at the expense of much money and vast stores of muscular energy, nor are their supplies inexhaustible. By means of the most efficient methods, moreover, a pound of coal can only be made to yield energy of the order of one horse-power for one hour. Yet, locked up in the atoms which constitute a pound of water, there is an amount of energy equivalent to ten million horse-power hours. There is no question that this colossal source of energy exists; but as yet physicists do not know how to release it; or, having done so, how to make it perform useful work.

This problem will be solved before 2029. Some investigator, at present in his cradle or unborn, will discover the match with which to light this bonfire, or the detonator needful to cause this terrific explosion.

The consequences of tapping such stupendous sources of cheap energy are almost illimitable. For the first time in his history, man will be armed with sufficient power to undertake operations on a cosmic scale. It will be open to him radically to alter the geography or the climate of the world. By utilizing some 50,000 tons of water, the amount displaced by a large liner, it would be possible to remove Ireland to the deeper portion of the Atlantic Ocean. The heat obtainable from the same quantity of water would suffice to maintain the polar regions at the temperature of the Sahara for a thousand years.

The liberation of this energy naturally will revolutionize travel and transport. Engines weighing one ounce for each horse-power they develop will become practical possibilities; and a power-plant of six hundred horse-power will carry fuel for a thousand hours, working in a tank no bigger than a fountain pen.

Concerning the nature of the vehicles for which such engines will provide the motive power, it is rash to prophesy. Passengers will travel in enormously swift aeroplanes, which by 2029 will ascend and descend vertically. Goods will be carried cheaply and rapidly by land or sea, propelled by motors whose fuel bill will be almost nil.

The coming of this new energy obviously will be accompanied by acute social problems. Its adaptation to industry will entail, for example, the final extinction of coal-mining. Since, however, it cannot but vastly reduce the cost of all manufactures, there is hope that the new wealth it creates will enable governments adequately to provide for the millions whose livelihood it destroys.

Some authoritative scientists do not believe that the solution of the power problem will be reached along these lines. They consider that either the winds or the tides will be forced to yield up their energy. Water-power is too unevenly distributed over the earth's surface, and too much affected by seasonal variations, ever to become the principal source of the world's energy; but the winds are never still, and the tides flow and ebb with unvarying precision.

If the winds were harnessed they could produce a superabundance of cheap power. During stormy weather their surplus energy could be stored in a variety of ways and so be available during calms.

THE exploitation of tidal energy presents difficulties which have yet to be solved in a satisfactory manner. These difficulties, however, are not those of principle but of technique; and if the wealth and the serious engineering attention of the world were focused on the question for ten years, there is no doubt that they would be overcome. The tides of the Bay of Fundy alone could supply the whole of North America with electrical energy.

By utilizing tidal energy to any large extent, we should diminish the speed of the earth's rotation. As it is, the tides act as a brake upon the rotation of the earth. Tidal friction occurs principally in the Bering Sea, which divides Alaska from Siberia. Its present effect is negligible, since it does but lengthen the day by a fraction less than a second in the course of each century.

If sufficient energy were extracted from the tides to supply every imaginable future development of human enterprise with power, this braking effect would not be greatly increased. Many millions of years would elapse before the day grew as long as our present week.

Five thousand years take us back to the dawn of recorded human history; so that even a tenth part of one million years carries us forward beyond the reach of (*Continued on page 176*)

likely to do this when the woman is not present and he calls her up in his imagination and writes to her. Then, it appears, the circumstances surrounding her, which happen to be not at all what he would like them to be, drop away from her; and he sees her not as she is, but as he likes to think her, and to this vision of beauty and sympathy he floods out his feelings.

As a matter of fact, the woman in such cases is almost always the man's inferior in wealth and usually in social position. In other words, she is one on whom he can confer material or social favors which he feels ought to earn her gratitude and make her satisfied with the rôle of emotional "outlet" to which he has, more or less unconsciously, assigned her.

He probably seldom says openly to himself that there is an obligation on her to keep his letters secret. But it is a quite evident fact that he expects her not to tell. To him, betrayal by her of what he writes her is a breach of confidence.

A newspaper man of my acquaintance has covered for his paper a very large number of "letter" cases.

"When publicity happens," he says, "the men aren't angry. They're hurt. They act like people whose feelings have been deeply injured. Every one of them knew that men get into trouble through writing such letters—but not one of the lot ever thought it was going to happen to *him*."

The man who wrote the first letter quoted above grew angry when he learned his correspondence was going to be made public, but the next instant he recovered himself.

"I'm afraid," he said quietly, "that I lost my temper. It was not on account of myself."

What disturbed him was that he knew that in his letters he had made frequent mention of friends high in the industrial and political affairs of the nation. He was, for a moment, enraged when he realized that their names would be drawn into the matter.

But toward the girl his manner was that of one disappointed and hurt. Men of that sort are accustomed to accept the result of their own mistakes; under these circumstances they act—logically or illogically—like persons who have made, as they now sadly realize, an error of judgment in trusting the wrong person.

But this attitude on the part of the men does not take into account the feelings of the women.

A girl who has received letters filled with words of burning love cannot well help feeling that she has been deliberately deceived when she discovers that the emotions back of them were temporary, and therefore, it would seem, "unreal." She becomes bitter, often revengeful and feels that someone ought to "pay."

Yet the man usually has not been consciously deceiving her.

The fast train, derailed, goes farthest off the track; and the man capable of bringing immense concentration, vision, imagination and self-forgetfulness to the consummation of a business deal cannot help making use of the same qualities when the object of his interest is a woman. She is to him, for the time being, as wholly desirable, as much the object of his keenest feelings as he tells her she is.

It would prevent many heartaches, much disillusionment—as well as many painful lawsuits—if the girl who finds herself the recipient of such letters would inquire whether it was indeed her amazing beauty and overwhelming attractiveness that caused them. Or were they merely the emotional outburst of a man revolting from the concentration of his business, professional or social life, and applying equal absorption to another object?

The answer she usually would find is that if she were not there, he would be writing exactly the same things to some other woman.

100 Years From Now (*Continued from page 71*)

imagination. We need not, therefore, grow alarmed that by harnessing the tides we shall so retard the rotation of the earth as to embarrass our remotest descendants. But the forty-eight-hour day is a possibility in the far future.

During the next hundred years, applied physics will certainly develop wireless telephony and television beyond our present most imaginative expectations. By 2029 it should be possible for any person sitting at home to be "present" at no matter what distant event. Stereoscopic television in full natural colors, and perfected wireless telephony will enable him to see and hear any event which is broadcast as effectively as if he stood beside the transmitting apparatus.

Such developments must influence the future of politics; for by their aid it will be feasible once more to revive that form of democracy which flourished in the city-states of Ancient Greece.

By 2029 the chosen spokesman of each political party will be able to address every voter as effectively as he now can address the House of Commons. And so the electorate itself, rather than its representatives, may decide each vital political issue. After the spokesman of each party has had his (or her) say, the votes of the entire country could be recorded and counted by mechanism installed in the telephone exchanges. Within twenty minutes from the end of the last speech, the will of a national jury on any subject could be ascertained and announced.

Applied chemistry has not affected human life in a manner comparable with the changes produced by physical research. So far as the ordinary man is concerned, chemistry is only useful to him when it discovers new and desirable substances; or discovers a means of synthesizing a material more cheaply than it is produced in nature. In the past, chemists have enriched the resources of humanity with new metals, dyes, drugs, explosives, and other substances useful in industry or in private life. By 2029 thousands more such new substances will be available; aluminum will be cheaper than pig iron is today; malleable, unbreakable glass will be a commonplace of domestic life.

It has also been suggested that chemical research will turn to the discovery of new physiologically pleasant substances. At present civilized mankind has discovered and adopted only three such substances: tobacco, alcohol and caffein (tea and coffee). These certainly have added enormously to the amenities of existence; and Doctor J. B. S. Haldane has proposed that chemists should seriously consider a search for many more such additions to human enjoyment.

Most chemical substances are either disagreeable or dangerous in their physiological effects, though a small number, not more than a few thousands, are valuable to medicine. Should chemistry in the next hundred years be able to discover a dozen substances as pleasant and harmless as tobacco, yet each producing a different effect on the consumer, it will have earned the thanks of every hard-worked man and woman in the world.

Any developments in physics and chemistry which reasonably may be predicted to occur before 2029 do no more than alter the accidentals of human existence. In biology, however, developments may be predicted which will change the whole nature of life as we experience it today.

Even those who know least about them confidently expect prodigious advances from medicine and surgery in the near future, and their faith will not be vain. The abolition of epidemic disease by 2029 is fairly certain, as is the discovery of cures for such scourges as cancer and tuberculosis. Complete and prolonged local anesthesia will become practicable; so that not only will operations be painless, but the patient will feel no pain afterwards as a result of them.

Such an advance also entails completely painless childbirth.

Biologists by 2029 will have learned the secrets of the living chemistry of the human body—or at least enough of it to achieve startling results. Rejuvenation will be an ordinary and well-recognized matter of a few injections at appropriate intervals.

The desire to keep old age at bay has ever been one of the dreams of humanity; at last we can predict that it will be achieved. "This mortal must put on immortality" by extending the length of his days on earth.

The attraction of such an idea, especially to women, who will no longer grow old quickly, is too clear to require emphasis. But the universal practise of rejuvenation will be accompanied by grave social problems, the least of which would be the immense increase in population.

Suppose it possible to guarantee one hundred and fifty years of life to every healthy child, how will youths of twenty be able to compete in the professions or in business against vigorous men, still in their prime at one hundred and twenty, with a century of experience on which to draw? The benefits to humanity which will accrue if the lives of men of genius are so prolonged is obvious.

Before 2029 biologists will have solved some of the mysteries of human heredity. Heredity is determined by certain "genes" or units, concerning which science already knows much. They are minute bodies, so small that, if a hen's egg were magnified to the size of the world, one of the genes in it would lie on a fair-sized dining-table. When biologists can control these, they will be able to control heredity.

Most probably by 2029 a clever young man will consider his fiancée's hereditary complexion before proposing marriage; and the young woman of that day will refuse him because he has inherited a gene from his father which will predispose their children to quarrelsomeness. By intelligent combinations of suitable genes, it will be possible to predict with reasonable certainty that truly brilliant children shall be born of a marriage.

It is possible, however, that by 2029 the whole question of human heredity and eugenics will be swallowed up by the prospect of ectogenetic birth.

By this is meant the development of a child from a fertilized cell outside its mother's body—in a glass vessel filled with serum on a laboratory bench. Such a proceeding is neither incredible nor, indeed, impossibly remote. The results of much research show that the connection between a mother and her growing child are purely chemical; there is no valid reason why one day biologists should not be able perfectly to imitate that chemical connection in the laboratory.

The possibility of ectogenetic children will naturally arouse the fiercest antagonism. Religious bodies of many different creeds will rally their adherents to fight such a fundamental biological invention. In fact the mere mention of its possibility here may strike many readers as gratuitously disgusting. Nevertheless the thing is possible; and since it is possible, it is certain that scientists will be deterred by no persecution from straining after it.

Should ectogenesis ever become an established part of human society, its effects will be shattering. Primarily it will separate reproduction from marriage, and the latter institution will become wholly changed. Further, the character of the future inhabitants of any state could be determined by the government which happened temporarily to enjoy power. By regulating the choice of the ectogenetic parents of the next generation, the Cabinet of the future could breed a nation of industrious dullards, or leaven the population with fifty thousand charmingly irresponsible mural painters.

A further immediate consequence of ectogenesis would be a plea that society should be allowed to produce the human types it most needs, instead of being forced to absorb all the unsuitable types which happen to be born. If it were possible to breed a race of strong healthy

creatures, intelligent to perform intricate drudgery yet lacking all ambition, what ruling class would resist the temptation?

Many of the arguments brought against slavery would be powerless in such a case; for the ectogenetic slave of the future would not feel his bonds. Every impulse which makes slavery degrading and irksome to ordinary humanity would be removed from his mental equipment. His only happiness would be in his task; he would be the exact human counterpart of the worker bee. Only the arguments of religion could be used to prevent his evolution. His emancipation could never be considered, for in freedom he would find only crushing boredom and misery.

It seems improbable, however, that the future developments of industry will call for such a being to tend its wheels. Production will become so cheap, and, barring political or international upheavals, wealth will accumulate to such an extent, that the ectogenetic Robot will never be needed. It is far more likely that men will work as machine-minders for one or two hours a day and be free to devote the rest of their energies to whatever form of activity they enjoy.

Such a condition obviously presupposes that all drudgery, not only the drudgery of the coal-mine and the machine-shop, will be abolished by science. It predicates the end of agriculture as the fundamental industry upon which human life rests. Probably biology, in alliance with chemistry, will make an end of agriculture even sooner than the cheapening of production will render a ten-hour maximum week universal in the workshops of the world.

By 2029 agriculture, if not abolished, will be in decay—at least in civilized lands. The first step towards the end of agriculture will be the production of benevolent bacteria able to "fix" the atmospheric nitrogen which is essential to the growth of plant life.

Such bacilli never could develop naturally, since many of their ancestors will be unable to live except under entirely artificial conditions in a laboratory. But when the active nitrogen-fixing bacteria are at last hardened off and allowed to multiply in agricultural land, their immediate effect will be to act as a super-efficient manure. By their aid five or even ten ears of wheat will grow where one grows now; while the pasture which now feeds ten beasts will feed fifty.

Such a development will, of course, be watched with anxious eyes by all governments. Food prices will slump; millions of laborers all over the world will find their livelihood vanished.

Hard on the heels of this development will come the perfection of synthetic foodstuffs.

At present we nourish ourselves by a curiously wasteful and roundabout method. Solar energy is absorbed by plants and stored by them in their structures, mainly in the form of cellulose. The human body is unable to digest cellulose, and so to extract nourishment from it. Many animals, however, aided by obliging bacteria, are able to perform this feat; and we keep herds of sheep, cattle and pigs, all engaged in the task of digesting cellulose and transforming it into the meat and milk upon which we live.

Already it is possible to convert indigestible cellulose into digestible sugar, but as yet the cost of the operation prevents its being carried out except as a laboratory experiment. Such processes as this will certainly be further investigated and developed, so that by 2029 starch and sugar (two of our most valuable foods) will be as cheap as sand or sawdust today.

Concerning proteins, the other most important human foods, two possibilities exist. Either they too will be produced synthetically; or else the more highly prized varieties of animal foods—such, for example, as beefsteak or chicken's breast—will be grown in suitable media in the laboratory.

From one "parent" steak of choice tenderness, it will be possible to grow as large and as juicy a steak as can be desired. So long as the parent is supplied with the correct chemical nourishment, it will continue to grow indefinitely and perhaps eternally. Whenever it is sufficiently large a few pounds can be cut from it and sent to market.

Synthetic foods and the production of animal tissues *in vitro* will finally set at rest those timid minds which prophesy a day when the earth's resources will not feed her children. Though all the inhabitable surface of the globe were inconveniently crowded, the millions of mankind could still be fed to repletion by such means.

This second revolution in food production will consummate the decay of agriculture, which can only survive as a rich man's hobby.

Probably, however, the synthetic foods of the next century will be so much more easily digested and appetizing than their present equivalents that agriculture will survive only in historical romances.

Since the beginnings of history the city has been the parasite of the countryside. In 2029 science will make the city a self-supporting unit, and Britain a land of laboratories capable of feeding no matter how many millions of mouths without importing a ton of foodstuffs.

Many will bewail such a prospect, for they insist that a flourishing agricultural peasantry is the only sound basis of any political life. It will be necessary, when agriculture goes into irrevocable decay, to plan the evolution of a stable industrial society.

Such an undertaking should not lie beyond human wit. The agricultural basis of society, which has existed for so many centuries, was itself evolved from nomads and savages. To reconcile such folk with the peaceful static life of the husbandman needed a far more violent adjustment than will be necessary to urbanize the descendants of the world's present agriculturists.

It is conceivable that not all these changes will have occurred by 2029. The progress of scientific discovery is checkered, and subject to no ascertainable regularity or period. In many instances an applied science after a few years of violent progress stagnates, or, at best, is advanced by small refinements and simplifications.

The history of the locomotive steam-engine provides an illustration. During the last half-century railway trains have grown steadily longer and heavier. In consequence larger and more powerful engines have been evolved to draw them to their destinations. But the huge locomotive of today differs only in size and power from its parent of the 1860's and 1870's. No new principle of any importance has been introduced into its design or construction.

A similar stagnation may overtake the development of airplanes or of wireless telephony. Such halts in the progress of any applied science, however, are comparative and not final. A fresh mind produces a new idea or a simplification which inaugurates another period of rapid and sweeping activity.

I have assumed, therefore, that the rate of progress in applied physics, chemistry and biology during the next hundred years will be maintained approximately at its present level. It may even be greatly accelerated by the ever-increasing interest in scientific research on the part of industrialists and governments.

Nevertheless, unless science is able to change our ideas no less rapidly than our environment, some of the developments at which I have hinted may not come to pass. Unless, for example, the ideas of Asiatic peoples are drastically changed, it will be impossible to stamp out epidemic disease from the world.

But it is not self-evident that all applications of scientific discovery deserve the support of intelligent men and women. Because science has benefited humanity in the past, there is no reason why it always should do so in the future. A biological discovery may well plunge the world into such a catastrophe as would destroy civilization for a thousand years. As you are reading these words, some disinterested researcher may detonate an atomic explosion which will involve the world and reduce it to a flaring vortex of incandescent gas.